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Genera of FUNGI in OHIO SOILS

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INTRODUCTION

Since 1952, members of the Department of Botany and Plant Pathology have been studying the effects of cropping sequences and cropping practices on incidence of root rots of field crops and associated soil microorganisms. During this study a large number of different types of fungi were isolated, some of which had not been previously reported from soils. A comprehensive study of Ohio soil fungi has not yet been made. This report is a preliminary list of genera and groups of fungi isolated from certain cultivated field soils in Ohio by a soil-dilution plate method.

Materials and Methods:

Soils were sampled by pooling 8 or 32 soil cores, 1 inch in diameter and 3 inches long, from each field. The fields were cropped to corn, wheat, oats, soybeans, alfalfa, sugar beets, and rye grass-blue grass mixture. Three soil types were sampled: Brookston clay loam, Toledo silty clay, and Wooster silt loam. From each thoroughly mixed, pooled sample, a 250 mg sub-sample was suspended in 50 ml of a 1 percent solution of CMC[1] by mixing with a mechanical stirrer for 1 minute. One dilution of this suspension was made resulting in a final dilution of 1:10,000. One ml of the final suspension was pipetted into petri-plates and mixed with 10 ml of warm OAES medium. The formula for 1 liter of OAES medium is:

Agar	20	g
Glucose	5	g
Bacto-Yeast Extract	2	g
Sodium nitrate	1	g
Magnesium sulfate	0 5	g
Potassium phosphate (Monobasic)	1	g
Streptomycin sulfate	50	mg
Chloromycetin	50	mg
Bacto-Oxgall	1	g
Sodium propionate	1	g
Distilled water	1000	ml

Autoclave at 11 pounds pressure for 15 minutes.

[1]CMC = 120 high viscosity Carboxy-methyl cellulose furnished by Hercules Powder Company, Wilmington 99, Delaware.

The plates were incubated at 25° C for 5 days at which time all fungal colonies were counted and marked. As soon as adequate sporulation occurred, the fungi were identified. In most cases, it was not necessary to transfer colonies to other media for identification, but confirmation was obtained for the Aspergilli, Penicillia, and some other genera by using Czapek-Dox medium. The few selected publications used for most of the identifications were:

Barnett, H. L. 1955. Illustrated genera of imperfect fungi. 218 pp. Burgess Publishing Co., Minneapolis, Minn.

Bender, H. B. 1931. The genera of Fungi Imperfecti: North American species and hosts with particular reference to Connecticut. 2000 pp. Ph.D. Thesis, Yale University, New Haven, Conn.

Bender, H. B. 1934. The Fungi Imperfecti: Order Sphaeropsidales. 52 pp. Published by the author, North Woodbury, Conn.

Clements, F. E., and C. L. Shear. 1954. The genera of fungi. 496 pp. Hafner Publishing Co., New York, N. Y.

Engler, A., and K. Prantl. 1900. Die naturalichen pflanzenfamilien. Teil I. Abt. 1. Wilhelm Englemen, Leipzig.

Gilman, J. C. 1945. A manual of soil fungi. 392 pp. The Collegiate Press, Inc., Ames, Iowa.

Raper, K. B., and C. Thom. 1949. Manual of the Penicillia. 875 pp. The Williams and Wilkins Co., Baltimore, Md.

Thom C., and K. B. Raper. 1945. Manual of the Aspergilli. 373 pp. The Williams and Wilkins Co., Baltimore, Md.

Results:

The genera and groups of fungi found in Ohio soils are listed in Table 1.

TABLE 1.—Types of fungi isolated from cultivated Brookston clay loam, Toledo silty clay, and Wooster silt loam soils in Ohio

Fungus group or genus	Relative prevalence*
Phycomycetes:	
Absidia	++
Actinomucor	++
Circinella	++
Cunninghamella	++
Mortierella	+
Mucor	+++
Pythium	+
Rhizopus	+++
Thamnidium	+
Zygorhynchus	+
Ascomycetes:	
Chaetomium	+++
Sordaria	+

Fungus group or genus	Relative prevalence*
Fungi Imperfecti:	
Acremonium	+
Acrostalagmus† = Verticillium	
Alternaria	+
Ascochyta	+
Aspergillus	+ + + +
A. candidus group	+
A. clavatus group	+
A. flavipes group	+ +
A. flavus group	+
A. fumigatus group	+ + +
A. niger group	+ +
A. ochraceus group	+ +
A. sulphureus group	+
A. ustus group	+
A. versicolor group	+
A. wentii group	+
Beauvaria	+ +
Botrytis	+ +
Botryosporium	+
Candida	+
Catenularia	+
Cephalosporium	+ + +
Chaetomella	+
Cladosporium	+ + +
Colletotrichum	+ +
Coniothyrium	+ +
Curvularia	+
Cylindrocarpon	+
Dactylaria	+
Dendrostilbella	+
Dicoccum	+
Echinobotryum	+
Epicoccum	+
Fusarium‡	+ + + + +
F. episphaeria	+ +
F. lateritium	+
F. moniliforme	+
F. oxysporum	+ + +
F. roseum	+
F. solani	+ + + +
Geotrichum	+ +
Gliobotrys† = Stachybotrys	
Gliocladium	+ + +
Gliomastix	+ +
Gonatobotryum	+
Haplobasidium	+
Helminthosporium	+
Hormodendron† = Cladosporium	
Hormiscium	+
Hyalopus† = Cephalosporium	
Isaria	+
Memnoniella	+
Monilia	+ +
Monosporium	+ +
Monotospora	+ +
Mycogone	+

Fungus group or genus	Relative prevalence*
Myrothecium	+ + +
Nigrospora	+
Oospora	+ +
Paecilomyces	+ +
Papularia	+
Papulospora	+
Penicillium	+ + + + +
P. adametzi series	+
P. brevi-compactum series	+
P. chrysogenum series	+
P. citrinum series	+ +
P. commune series	+ +
P. decumbens series	+ +
P. frequentans series	+
P. funiculosum series	+ + + + +
P. herquei series	+ +
P. implicatum series	+
P. janthinellum series	+ +
P. lilacinum series	+ + +
P. luteum series	+
P. nigricans series	+ +
P. oxalicum series	+ +
P. purpurogenum series	+ +
P. raistrickii series	+
P. ramigena series	+ +
P. restrictum series	+ +
P. roquefortii series	+
P. rugulosum series	+ +
P. thomii series	+
Periconia	+
Pestalotia	+
Phialophora	+
Phoma	+ + + +
Pullularia	+
Pyrenochaeta	+
Rhizoctonia	+
Robillarda	+
Scolecobasidium	+
Scopulariopsis	+ +
Sepedonium	+
Sphaeronema	+
Spicaria	+ +
Spondylocladium	+
Sporotrichum	+ +
Stachybotrys	+
Stilbella	+
Stemphylium	+
Stephenoma	+
Stysanus	+ +
Tetracoccosporium	+
Torula	+
Trichoderma	+ + + +
Trichurus	+
Trichothecium	+
Varicosporium	+
Vermicularia† = Colletotrichum	
Verticillium	+ + +

*Relative prevalence was estimated from the percent occurrence of each type from several samplings and is designated as follows:

\+ = Rare; less than 1 percent.
++ = Occasional; 1 to 2 percent.
+++ = Frequent; 2 to 5 percent.
++++ = Common; 5 to 10 percent.
+++++ = Abundant; 10 percent or more.

†These genera are no longer acceptable according to Ainsworth, G. C., and G. R. Bisby. 1954. A dictionary of the fungi. 475 pp. The Commonwealth Mycological Institute, Kew, Surrey.

‡These groups are listed according to Snyder and Hansen:

Snyder, W. C., and H. N. Hansen. 1940. The species concept in Fusarium. Am. Jour. Bot. 27: 64-67.

Snyder, W. C., and H. N. Hansen. 1941. The species concept in Fusarium with special reference to section Martiella. Am. Jour. Bot. 28: 738-742.

Snyder, W. C., and H. N. Hansen. 1945. The species concept in Fusarium with reference to Discolor and other sections. Am. Jour. Bot. 32: 657-666.

Discussion:

The fungal populations, as estimated by the techniques used in this study, ranged from 40,000 to 200,000 viable units per gram dry soil in the soils tested. A total of 81 genera were identified, as well as 21 series of Penicillia, 11 groups of Aspergilli, and 6 species groups of Fusarium. A number of fungi were isolated which could not be satisfactorily placed in any genus described in the publications used in identification. More than one species was found for many of the genera and groups listed. It is planned that lists of species will be published in the future.

As pointed out by several of the foremost soil microbiologists, many different types of soil fungi are cosmopolitan in distribution. From preliminary data obtained at the Ohio Agricultural Experiment Station, it appears that most of the genera are present in all of the different soils tested, but that quantitative differences do occur. These differences are associated more with the crop history than with soil type. The effects of crop sequences on soil fungi will be discussed in another paper. To our knowledge representatives of a number of genera found in Ohio soils have not been previously reported as occurring in soil, but these types will probably be found elsewhere as more complete studies are made.